

REMARKS

Claim1 has been amended to further clarify the separately addressable aspect of the claimed sub-pixels. Claim 15 has been added. Support for these amendments can be found, for example, in the specification in FIG. 3 and its corresponding text. No new matter has been added. Upon entry of this amendment, claims 1-12 and 15 will be presented for consideration in this application.

Claims 1-12 remain rejected under 35 USC 103(a) as being unpatentable on Admitted Prior Art (APA) in view of Uno (US 5,748,276). This rejection is respectfully traversed.

Claim 1 recites a light modulating device having a number of elements in combination. The claimed combination includes at least one pixel comprising a plurality of separately addressable sub-pixels of different areas and an addressing means. The area of a first separately addressable sub-pixel is smaller than the area of a second separately addressable sub-pixel. The area of the second sub-pixel is not substantially a multiple of the area of the first separately addressable sub-pixel. The first and second sub-pixels each have an equal number of selectable transmission/reflection levels more than two.

This combination of elements as a whole is not taught or suggested, individually or together, by APA or Uno.

The Examiner relies on APA as teaching the subject matter of claim 1 but for the area of the second sub-pixel not being substantially a multiple of the area of the first separately addressable sub-pixel, for which the Examiner refers to FIG. 1a of Uno. The Examiner contends that it would have been obvious to modify the ratio of sub-pixel areas of APA in view of the teachings of Uno to arrive at the claimed invention. Applicants respectfully disagree.

As explained in the April 8, 2008 Response, Uno does not disclose separately addressable sub-pixels. For this reason, the skilled person would not consider Uno relevant to the

claimed subject matter, and therefore would find no teaching in Uno to suggest the use of separately addressable areas having a non-multiple area ratio for grayscale as claimed.

In the Response to Arguments section of the final rejection, however, the Examiner states that "Uno clearly teaches sub-pixels 26 and 26b are separately addressable" because the difference in driving voltage of the sub-pixels are controlled. Applicants respectfully disagree.

Even though Uno may apply different voltages to the sub-pixels, the sub-pixels of Uno are not separately addressable. Uno does not allow for the transmission level of one sub-pixel to be set independently of the other sub-pixel. As noted previously with regard to Uno, any driving signal applied to sub-pixel 21a inherently results in a lower driving voltage being applied to sub-pixel 21b. Additionally, if no voltage is applied to sub-pixel 21a, then no voltage is also applied to sub-pixel 21b. Hence, if a particular voltage level is applied to sub-pixel 21a, the arrangement of the device of Uno requires that the voltage level applied to sub-pixel 21b be fixed. Therefore, although sub-pixel 21a may be addressed with a different voltage level to that applied to sub-pixel 21b, the voltage levels applied are not separate, i.e. independent.

To further clarify this aspect of the claimed subject matter, claim 1 has been amended to recite that the addressing means selectively addresses each sub-pixel separately so as to select for that sub-pixel any one of the more than two transmission/reflection levels independently of the level selected for any other of the sub-pixels.

An example of this independent selection can be found in FIG. 13 and the supporting text in the specification. FIG. 13 shows two sub pixels, each with three grating shapes to provide four transmission levels. The smaller sub-pixel (the first separately addressable sub-pixel) is the one on the left and the larger sub-pixel is the one on the right.

The right hand of figure 13 shows the different selection. If the small pixel can be set to wholly white, the large pixel can also be set to wholly white (0), to two thirds white (3.5), to one third white (7) or to all black (10.5). Thus, all of the possible transmission levels of the large pixel

can be chosen with the small pixel wholly white. The same is true for any transmission level selected for the small pixel. This demonstrates the notion of separately addressable.

Accordingly, Uno does not teach a device where the level of one sub-pixel can be set independently of the level selected for any other of the sub-pixels. Uno is not concerned with a device having selectable defined transmission/reflection levels and is instead concerned with a monostable liquid crystal device that is addressed using rms addressing methods.

The Examiner further states that absent a showing of criticality it would be obvious to modify the pixel area ratios of APA. Applicants note that the ratio of sub-pixel sizes is deliberately chosen so that the larger sub-pixels are a multiple of the smaller sub-pixels. APA teaches that this is necessary to achieve good greyscale — i.e. good linearity. Thus, APA teaches a criticality of correct pixel sizing in the art. In contrast, Applicants have realized that a non-multiple pixel area ratio will lead to reduced linearity in greyscale (a negative) but with the advantage of relaxed manufacturing tolerances (a positive). Appropriate choice of a non-multiple ratio can therefore still provide good greyscale but with much easier manufacturing requirements. The skilled person would have been taught that larger sub-pixels should be a multiple of a smaller sub-pixel, rather than the non-multiple pixel area ratio as claimed.

Lastly, the basis for new claim 15 can be seen, for example, from FIG. 13 of the specification, wherein each sub-pixel has the same gratings in the same proportions and hence will lead to the same liquid crystal alignment. The subject matter of claim 15 is directed to providing good greyscale in a liquid crystal display device, such that at a particular viewing angle, the transmission or reflection levels of the various sub-pixels are chosen to achieve a certain overall brightness. It is therefore important that the liquid crystal molecules have the same alignment direction in each sub-pixel to avoid any viewing angle artifacts.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is

determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark Office determines that an extension and/or other relief is required, Applicants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952 referencing docket no. 527122000300.

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